



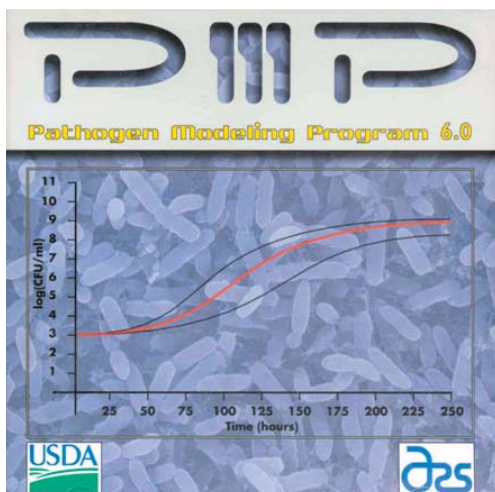
## Predictive Microbiology and Process Risk Models of Foodborne Pathogens

### Program Background

Understanding the risks of foodborne illness depends on knowledge of the specific environmental conditions which affect the pathogen's behavior (i.e., growth, survival and decline). The results of this research can then be translated into mathematical models which allow the user to estimate the behavior of a specific pathogen under unique environmental conditions.

Such models are used by food industries to define Critical Control Points (CCPs) in food processing operations, and in the subsequent development and implementation of Hazard Analysis & Critical Control Points (HACCP) food safety systems. In addition, these models can be used by risk assessors to define management decisions that may reduce the risk of foodborne disease.

The Pathogen Modeling Program (PMP) is a set of microbial models and a product of laboratory research in the Microbial Food Safety Research Unit (MFS) which is meeting the needs of its customers in government, industry and academia.



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### Research Objectives

The Predictive Microbiology & Process Risk Models of Foodborne Pathogens research program is addressing the following topics:

- validating predictions of the PMP in raw and processed foods.
- developing models of the behavior of pathogens in the presence of microorganisms naturally found in food.
- defining the behavior of pathogenic bacteria as affected by the level of contamination, the different types of pathogenic strains, and the physiological state of the pathogen.
- developing models of the behavior of pathogens over a series of food processing operations (process risk models).
- modeling the virulence of pathogens during growth and survival in food.

### Impact

Recent accomplishments of this research program include new models of the growth of *Salmonella* in poultry products which have been used in risk assessments developed by the World Health Organization and the Food & Agriculture Organization. In addition, the growth of *E. coli* O157:H7 strains in ground beef has been defined, demonstrating the effects of competitive native microflora, temperature, and fat level. This information reduces the level of uncertainty in risk assessments, and provides better estimates of risk.

Each year, the PMP is downloaded from the Internet by approximately 5000 users in 35 countries. Users are able to input specific information about their food products, and then receive predictions of pathogen behavior via easy-to-read graphical output. Future enhancements to the PMP include facilitating input of PMP data into risk assessment software, as well as incorporating an Expert System to provide users with more precise interpretations of PMP information.

For additional information contact Mark Tamplin  
[mtamplin@errc.ars.usda.gov](mailto:mtamplin@errc.ars.usda.gov); tel: (215) 836-3794

## Principal Investigators

Cheng-An (Andy) Hwang, Ph.D.  
Research Food Technologist  
tel. 215-233-6416  
fax. 215-233-6581  
[ahwang@errc.ars.usda.gov](mailto:ahwang@errc.ars.usda.gov)

Thomas P. Oscar, Ph.D.  
Research Food Technologist  
tel. 410-651-6062  
fax. 410-651-6581  
[toscar@mail.umes.edu](mailto:toscar@mail.umes.edu)

Mark L. Tamplin, Ph.D.  
Microbiologist/Lead Scientist  
tel. 215-836-3794  
fax. 215-233-6581  
[mtamplin@errc.ars.usda.gov](mailto:mtamplin@errc.ars.usda.gov)

## Project Personnel

Robert Liehr  
Biological Science Technician  
tel. 215-233-6798  
fax. 215-233-6581  
[rliehr@errc.ars.usda.gov](mailto:rliehr@errc.ars.usda.gov)

Jacqueline B. Ludwig, B.S.  
Biological Laboratory Technician  
tel. 410-651-6062  
fax. 410-651-6568  
[jludwig@mail.umes.edu](mailto:jludwig@mail.umes.edu)

Benne S. Marmer, M.S.  
Microbiologist  
tel. 215-836-3790  
fax. 215-233-6581  
[bmarmer@errc.ars.usda.gov](mailto:bmarmer@errc.ars.usda.gov)

John G. Phillips, Ph.D.  
Consulting Statistician  
tel. 215-233-6614  
fax. 215-233-6434  
[jphillips@errc.ars.usda.gov](mailto:jphillips@errc.ars.usda.gov)

Tod E. Stewart, M.S.  
Biological Laboratory Technician  
tel. 215-836-3748  
fax. 215-233-6581  
[tstewart@errc.ars.usda.gov](mailto:tstewart@errc.ars.usda.gov)

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